



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE TRUE ROGER BACON, I.

"MONOGRAPHS or studies concerning Bacon are numerous, perhaps too numerous", says a recent French writer.¹ Indeed, his *Opus Maius* has been analyzed and paraphrased so often that one marvels that all the juice has not been squeezed out of the orange. Not only his general philosophy, but his contributions to certain particular subjects have been repeatedly treated.² But the French writer goes on to say that in many of the monographs Bacon is misunderstood and misinterpreted, and that they must be read with the greatest caution. Also the catalogue of Bacon's works and fragments has been added to by recent discoveries.³ Thirdly, there are aspects of his learning which have hitherto not received special or proper treatment, namely, the astrology and magic to which he gives so much space and emphasis and which so seriously affect all his thought, but which probably did not affect his life and the attitude of his contemporaries to him in the way that so many have assumed. Finally, Bacon has been studied too much in isolation. He has been regarded as an exceptional individual; his environment has been estimated at his own valuation of it or according to some preconceived idea of his age; and his writings have not been studied in relation to those of his predecessors and contemporaries. Thought of as a precursor of modern science, he has been read to find germs of modern ideas rather than scrutinized with a view to discovering his sources. Yet his constant citing of authorities and the helpful foot-notes which Bridges, in his edition of the *Opus Maius*,⁴ gives to explain these allusions to other scientists, point insistently in the latter direction. When one has gone a step

¹ G. Delorme in Vacant and Mangenot, *Dictionnaire de Théologie Catholique* (Paris, 1910), II. 31. For bibliography of writings on Bacon see also the article "Roger Bacon" by Theophilus Witzel in the *Catholic Encyclopedia*.

² For example, Cardinal Gasquet opens his contribution to the collection of essays written in commemoration of the seventh centenary of Roger's birth by saying frankly: "The work of Roger Bacon in regard to the Vulgate is well known. His opinions as to the state of the text in the ordinary Bibles of the thirteenth century, and his suggestions as to the principles which should regulate any revision have been frequently set forth by those interested in the history of the Latin Vulgate, whilst many modern writers . . . have written specially upon this subject. Little therefore remains to be done but to follow in their footsteps." *Roger Bacon Essays* (collected and edited by A. G. Little, Oxford, 1914), p. 89. This will henceforth be cited as Little, *Essays*. I have reviewed this book in the *American Historical Review*, XX, 386-388.

³ The latest bibliography of Bacon's writings is contained in Little, *Essays*, pp. 376-425.

⁴ The *Opus Majus* of Roger Bacon (ed. J. H. Bridges, Oxford, 1897, and a third volume in 1900). This will henceforth be cited as Bridges.

further and has read for their own sake the works of men like Adelard of Bath, William of Conches, and Daniel Morlay in the twelfth century, or William of Auvergne, Robert Grosseteste and Albertus Magnus in the early and middle thirteenth century, the true position of Roger Bacon in the history of thought grows clearer. One then re-reads his works with a new insight, finds that a different interpretation may be put upon many a passage, and realizes that even in his most boastful moments Roger himself never made such claims to astounding originality as some modern writers have made for him. Conversely, one is impelled to the conclusion that Bacon's writings, instead of being unpalatable to, neglected by, and far in advance of, his times, give a most valuable picture of medieval thought, summarizing, it is true, its most advanced stages, but also including much that is most characteristic, and even revealing some of its back currents. It is from this standpoint that we shall consider Roger Bacon and endeavor to refute misconceptions that have grown up concerning his life and learning.

Past estimates of Bacon's learning have been greatly affected by their holders' views of his life; but his biography is gradually being shorn of fictions and losing that sensational and exceptional character which gave countenance to the representation of his thought as far in advance of his age. We cannot tell to which of several families of Bacons mentioned in feudal registers and other documents of the times he belonged, and the exact date and place of his birth are uncertain.⁵ But he speaks of England as his native land, and in 1267 looks back upon a past of some forty years of study and twenty years of specialization in his favorite branches of learning.⁶ Also he speaks of one brother as rich, of another as a student, and of his family's suffering exile for their support of Henry III. against the barons.⁷ He implies that up to 1267 he had not been outside France and England,⁸ but he had sent across the

⁵ Charles Jourdain, "Discussion de Quelques Points de la Biographie de Roger Bacon", in his *Excursions Historiques et Philosophiques à travers le Moyen Age*, pp. 131-145.

⁶ See pages 65 and 59 of *Fr. Rogeri Bacon, Opera quaedam hactenus inedita* (ed. J. S. Brewer, London, 1859), in vol. XV. of *Rerum Britannicarum Mediae Aevi Scriptores (Rolls Series)*. This will henceforth be cited as Brewer. The volume includes part of Bacon's *Opus Tertium*, part of the *Opus Minus*, part of the *Compendium Philosophiae*, and the *Epistola de Secretis Operibus Artis et Naturae, et de Nullitate Magiae*.

⁷ *Opus Tertium*, Brewer, pp. 16 and 13; see also, Rev. F. A. Gasquet, "An Unpublished Fragment of a Work by Roger Bacon", in the *English Historical Review*, XII, 502. This latter article will henceforth be cited as Gasquet. This fragment published by Gasquet is evidently the first part of the *Opus Minus*.

⁸ *Opus Minus*, Brewer, p. 318. If however we accept as a genuine work of Bacon the letter on retarding the accidents of old age which he is supposed to have sent to Pope Innocent IV. (1243-1254), we shall have to admit that he had been "in partibus Romanis". See Little, *Essays*, pp. 4 and 399.

seas for material to assist his special investigations and had spent large sums of money.⁹

Before he became a friar he had written text-books for students, and had worked so hard that men wondered that he still lived. When or why he joined the Franciscans we are not informed, but his doing so is no cause for wonder, for both orders were rich in learned men, including students of natural science. Bacon tells us that after becoming a friar he was able to study as much as before, but "did not work so much", probably because he now had less teaching to do. For about ten years before 1267, instead of being imprisoned and ill treated by his order, as was once believed without foundation, he was, as we now know from his own words discovered in 1897, in poor health and "took no part in the outward affairs of the university". This abstention caused the report to spread that he was devoting all his time to writing, especially since many were aware that he had long intended to sum up his knowledge in a *magnum opus*, but he actually "composed nothing except a few chapters, now about one science and now about another, compiled in odd moments at the instance of friends". At least this is what he told the pope in 1267 when trying to excuse himself for having had no completed work ready to submit to the supreme pontiff.¹⁰

R. H. Major's *Prince Henry the Navigator*¹¹ is responsible for the spread of the story that in 1258 Brunetto Latini saw Friar Bacon at the Parliament at Oxford and was shown by him the secret of the magnetic needle, which Roger dared not divulge for fear of being accused of magic. The supposed letter of Brunetto Latini to the poet Guido Cavalcanti, from which these data are drawn, seems to have been a hoax or fanciful production appearing first in 1802 in the *Monthly Magazine*¹² among "Extracts from the Portfolio of a Man of Letters", who is said to have translated them from "the French patois of the Romansch language". Certainly the mariner's compass was pretty well known in Bacon's time, nor are we informed of any case where it involved its possessor in a trial for magic. Bacon says in one passage that if the experiment of the magnet with respect to iron "were not known to the world, it would seem a great miracle".¹³ In another place he grants that even the common herd of philosophers know of the magnetic needle; he merely criticizes their belief that the needle always turns towards

⁹ Gasquet, p. 502.

¹⁰ Ibid., p. 500, and *Opus Tertium*, Brewer, p. 65.

¹¹ Brewer, p. 58.

¹² *The Monthly Magazine or British Register*, XIII. 449.

¹³ Bridges, II. 218.

the north star; Roger thinks that it can be made to turn to any other point of the compass if only it has been properly magnetized.¹⁴ Perhaps the Latini story was suggested by a third passage, where Bacon says, in order to illustrate his statement that philosophers have sometimes resorted to charms and incantations to hide their secrets from the unworthy, "As if, for instance, it were quite unknown that the magnetic needle attracts iron and someone wishing to perform this operation before the people should make characters and utter incantations, so that they might not see that the operation of attraction was entirely natural".¹⁵

Bacon's career centres about a papal mandate which was despatched to him in the summer of 1266. Guy de Foulques, who became Clement IV. on February 5, 1265, had at some previous time requested Bacon to send him the *scriptum principale* or comprehensive work on philosophy which he had been led to think was already written.¹⁶ On June 22, 1266, he repeated this request in the form of a papal mandate, which is extant.¹⁷ The former letter is lost, but both Bacon and the pope refer to it.¹⁸ Somehow writers on Bacon have paid little heed to this first request, have assumed that Bacon wrote his three works to the pope in about a year¹⁹ despite the "impediments" upon which he dwells, and have therefore been filled with admiration at the superhuman genius which could produce such works at such short notice while laboring under such difficulties.²⁰ But this is assuming that Roger had done nothing in the considerable interval between the two mandates.

¹⁴ *Opus Minus*, Brewer, pp. 383-384.

¹⁵ *Epistola de Secretis Operibus Artis*, Brewer, p. 525.

¹⁶ Gasquet, p. 511: "Scripto principali, quod vestra postulat reverentia". *Opus Tertium*, Brewer, p. 58: "Propter vestrae gloriae mandatum, de quo confundor et doleo quod non adimplevi sub forma verborum vestrorum, ut scriptum philosophiae mitterem principale." Also p. 18.

¹⁷ Brewer, p. 1; Bridges, I. 1-2, note; Wadding, *Annal. Minor.*, IV. 265; Martene, *Thesaurus Novus Anecdotorum*, II. 358.

¹⁸ Brewer, p. 1: "Opus illud quod te dilecto filio Raymundo de Landuno comunicare rogavimus in minori officio constituti." *Opus Tertium*, Brewer, p. 14: Bacon says that Albert and William of Shyrwood could not send the pope what he has written, "infra tantum tempus . . . a vestro mandato; et sicut nec ab ultimo, sic nec a primo". Gasquet, p. 500: "Sed licet pleno desiderio quod iniunctum est complere pro posse meo sim teste Deo paratissimus, cum quoniam in minori officio constituti postulasti non fuerunt composita que iussistis" and "utrumque mandatum" and "antequam primum vestre dominationis recepi mandatum." The following sentence (*Opus Tertium*, Brewer, p. 13) also seems to refer to the former mandate, despite the "ultimo", "Non enim quando ultimo scripsistiis fuerunt composita quae iussistis, licet hoc credebatis."

¹⁹ Little, *Essays*, p. 11: "His first project was an elaborate one, including a systematic and scientific treatment of the various branches of knowledge; he worked at this, writing parts of the *Communia Naturalium* and *Communia Mathematicae*, for some months ('till after Epiphany', i. e. January 6, 1267), but found it impossible. He then started again on a more modest scale and wrote in the next twelve months the preliminary treatise known as the *Opus Maius*, which was supplemented by the *Opus Minus*, and, subsequently, by the *Opus Tertium*."

²⁰ Brewer, p. xlvi.

And why does he keep apologizing for "so great delay in this matter", and "your clemency's impatience at hope deferred"?²¹ Moreover, his excuses do not all apply to the same period, and most of them are excuses for not having composed a full exposition of philosophy rather than for not having composed sooner the *Opus Maius*, which Roger regarded as a mere preamble to philosophy. One set of excuses explains why he had no comprehensive work ready when the first request arrived.²² A second set explains why he had not written it in the interval between the two mandates.²³ A third set explains why he finally does not write it at all but sends instead an introductory treatise, the *Opus Maius*, supplemented by two others, the *Opus Minus* and *Opus Tertium*. Of course some excuses hold equally good for all three periods. But he states in the third treatise that in writing the second he was free from some of the "impediments" which had hampered his composition of the *Opus Maius*.²⁴ As he also says that one reason for writing the *Opus Minus* was lest the *Opus Maius* be lost amid the great dangers of the roads at that time, one infers that the latter work was despatched before the other. Moreover, the *Opus Minus* opens with a eulogy of the pope which is absent in the *Opus Maius*,²⁵ in which there are very few passages to suggest that it is addressed to the pope, or written later than 1266.²⁶

²¹ *Opus Tertium*, Brewer, p. 14: "Non igitur mirandum si ego dilationem tantam fecerim in hac parte." *Ibid.*, pp. 16-17: "Multotiens dimisi opus, et multotiens desperavi et neglexi procedere." *Ibid.*, p. 17: "Tanta dilatio in hoc negotio . . . vestrae clementiae taedium pro spe dilata", and other passages.

²² These excuses are listed in Gasquet, p. 500, to "antequam primum vestre dominationis recepi mandatum"; and are repeated in part in *Opus Tertium*, Brewer, p. 13.

²³ To this period the difficulties listed in *Opus Tertium*, Brewer, pp. 15-17 (middle), would seem to apply. In Brewer, p. 16, and Gasquet, p. 502, Bacon states that to get money to meet the expenses incident to the composition of his work he had sent to his rich brother in England, but received no response because "exiles and enemies of the king occupied the land of my birth", while his own family had been exiled as supporters of the crown and ruined financially. All this must have occurred before the arrival of the second papal letter in 1266, for Simon de Montfort had been slain and the barons defeated in 1265.

²⁴ *Opus Tertium*, Brewer, p. 5: "Et impedimentorum remedia priorum nactus".

²⁵ As Bacon himself states in the *Opus Tertium*, Brewer, p. 7, "Primo igitur in opere Secundo".

²⁶ I cannot agree with Gasquet, p. 497, that it "is obvious from numberless expressions in the work itself" that the *Opus Maius* was "addressed to the pope directly". The last chapter of the first book in Bridges's text is evidently addressed to the pope, but it is identical with a portion of the *Opus Minus* and evidently does not belong in the *Opus Maius* and is not found in the two oldest manuscripts. Similarly a passage of some 16 pages in Bridges on calendar reform, which gives the present year as 1267, is practically identical with a chapter of the *Opus Tertium* and was evidently transferred from that work to the *Opus Maius* at some later date. When we have excluded these passages the work is surprisingly free, compared to the other two works, from passages suggesting that it is addressed to the pope. The one mention of the "Apostolic See" (Bridges, I. 77; III. 94) is impersonal and does not imply that Foulques was pope, and

The *Opus Maius*, therefore, was practically finished, if not already sent, when the papal mandate of 1266 reached Bacon. When Roger learned that Foulques as pope was still interested in his work, visions of what the apostolic see might do for his programme of learning and himself flashed before his mind, and, after a fresh but vain effort at a *scriptum principale*, which kept him busy until Epiphany, he composed the supplementary treatise, the *Opus Minus*, with its adulatory introduction to Clement IV., with its excuses for sending or having sent a preambulatory treatise instead of a complete work of philosophy, with its hints that such a final treatise can be successfully completed only with the financial backing of the unlimited papal resources, with its analysis of the preceding work for the benefit of the busy pope and its suggestions as to what portions of it he might profitably omit, and with its additions of matter which in the *Opus Maius* Roger had either forgotten or at that time had not been in a position to insert. The third work, *Opus Tertium*, is of the same sort but apparently more disorderly in arrangement, and looser and more extravagant in its tone. Presumably it was undertaken to remind the pope again of Bacon's existence and proposals; it is even conceivable that Roger was a little unstrung when he composed it; it has been suggested that it was left unfinished and never sent to the pope, who died in 1268. A part at least of the *Opus Tertium* was written in 1267.²⁷

The extant papal mandate orders Bacon not only to send his book, but to state "what remedies you advise for the matters indicated by you recently on so critical an occasion", and to "do this without delay as secretly as you can".²⁸ This allusion to a crisis

does not occur in one of the manuscripts. Epithets such as "Your Wisdom" (Bridges, I. 17, 23, 305), "Your Highness" (I. 210; II. 377), "Your Glory" (I. 305; III. 96), "Your Reverence" (I. 376; II. 219), "Your Holiness" (I. 81; III. 101), "Your Beatitude" (I. 2, 72; III. 88) do not occur frequently and are either equally applicable to a cardinal, or not found in all the manuscripts, suggesting the possibility of their having been inserted later.

²⁷ Such seems to me the most plausible theory of the writing of the three works and the one which agrees best with Bacon's own statements; but it is only a hypothesis from the printed texts of his works which should be verified by examination of the manuscripts. Probably some of Bacon's statements can be interpreted to conflict with this hypothesis, but they sometimes conflict with each other, and he could not even keep the *scriptum principale* and *Opus Maius* distinct in his own mind according to Brewer's text (p. 3, "duo transmisi genera scripturarum: quorum unum est principale", and p. 5, "principalis scripturae", whereas at p. 60 we read, "Patet igitur quod scriptum principale non potui mittere"). See also Gasquet, p. 503, and *Opus Tertium*, Brewer, p. 58. I have been stimulated by but cannot accept the conclusions of Father Mandonnet's "Roger Bacon et la Composition des Trois 'Opus'", *Revue Néo-Scolastique* (Louvain, 1913), pp. 52-68, and 164-180. Mandonnet holds that the *Opus Maius* was written *after* the other two works, which were never finished nor sent, but from which Roger took some passages to insert in the *Opus Maius*, which Mandonnet believes was sent only in 1268.

²⁸ "Quae tibi videntur adhibenda remedia circa illa, quae nuper occasione tanti discriminis intimasti: et hoc quanto secretius poteris facias indilate." Brewer, p. 1.

and this injunction of secrecy have cast a certain veil of mystery over the three works and the relations of Roger and the pope. The recent critical occasion may have been the time when Guy de Foulques as papal legate was refused admission to England; or, if we judge from the contents of Bacon's replies, the crisis would seem to be either the menace of the Tatars to the western Christian world, or the near advent of Antichrist, in which Bacon with many others of his century seems to have believed, or the situation in the contemporary world of learning, which Roger certainly regarded as requiring the immediate application of remedies. Observance of secrecy may have been intended to guard against such frauds of copyists as we shall soon hear Bacon describe, or to secure some alchemistic *arcana* or practical inventions which the pope had been led to expect from him. Indeed, so far as alchemy was concerned, Bacon observed the injunction of secrecy so strictly that he divided his discussion of the subject among four different treatises sent to the pope at different times and by different messengers, so that no outsider might steal the precious truth. It must be added that even after receiving all four installments, the pope would not have been much nearer the philosopher's stone than before.²⁹

Another moot question in Bacon's biography besides that of the composition of the three works is that of his relations with the Franciscan order. We have seen that it was natural for him to join it, and that the change, at first at least, seemed one for the better. Bacon, however, found irksome the rule made by the order in 1260, as a consequence of the publication in 1254 of Gerard's heretical *Introductorius in Evangelium Aeternum*, that in the future no Franciscan should publish anything without permission.³⁰ Roger wished to employ amanuenses even in composing his works, and these men, he tells the pope, would often divulge "the most secret writings" and so involve one in unintentional violation of the above rule. "And therefore", says Bacon, "I did not feel the least bit like writing anything".³¹ For a man so easily discouraged one cannot feel much sympathy. There is however another important inference from his statement: instead of his writings being neglected by his age, they are so valued that they are pirated before they have been published. Moreover, this rule of his order

²⁹ *Part of the Opus Tertium of Roger Bacon* (ed. A. G. Little, Aberdeen, 1912), pp. 80-82. This passage is the fourth one and in it Bacon lists the three earlier statements: "Scripsi in tribus locis Vestre Glorie de huiusmodi secretis." Roger ultimately decides that he will not reveal the whole secret even in this fourth installment, because alchemists never put the full truth into writing; he therefore "reserves some points for word of mouth".

³⁰ See the article on "Roger Bacon" by Theophilus Witzel in the *Catholic Encyclopedia*.

³¹ Gasquet, p. 500. "Et ideo componere penitus abhorrebam", etc.

should not have hampered Bacon much in writing for the pope; indeed, Roger himself implies that he was exempted from this restriction in the earlier request from the cardinal as well as in the later papal mandate. Raymond of Laon, Bacon grants, had correctly informed "Your Magnificence, as both the mandates state", concerning this regulation, though he had given a wrong impression as to what Bacon already had written.³²

We have heard from Bacon's own mouth that he did little public teaching after becoming a friar, that he had as much time for private study as ever, and that everybody supposed him to be at work at his *magnum opus*. Yet in the *Opus Minus* he grumbles that "his prelates were at him every day to do other things"³³ before he received the first mandate from the cardinal, and that even thereafter he was unable to excuse himself fully from their demands upon his time, "because Your Lordship had ordered me to treat that business secretly, nor had Your Glory given them any instructions".³⁴ In the *Opus Tertium* he describes the same situation in stronger language: "They pressed me with unspeakable violence to obey their will as others did", and "I sustained so many and so great set-backs that I can not tell them".³⁵ On how we interpret a few such passages as these depends our estimate of the attitude of the Franciscan order before 1267 to Bacon and his ideas and researches. He gives so many other reasons why he has no comprehensive work of philosophy ready for the pope that this attitude of his superiors seems a relatively slight factor. He needed much money, he needed expensive instruments, he needed a large library, he needed "plenty of parchment", he needed a corps of assistant investigators and another of copyists with skilled superintendents to direct their efforts and insert figures and other delicate details. It was a task beyond the powers of any one man; besides, he was in ill-health, he felt languid, he composed very slowly. Shall we blame his superiors for not providing him with this expensive equipment; and are we surprised, when we remember that the mandates directed him to send a book supposed to be already finished, that his superiors continued to ask of him the performance of his usual duties as a friar? Surely their attitude cannot be called persecution of Bacon nor hostility to his science.³⁶

³² Gasquet, p. 500.

³³ *Ibid.*

³⁴ *Ibid.*, p. 502.

³⁵ *Opus Tertium*, Brewer, p. 15.

³⁶ P. Feret, "Les Emprisonnements de Roger Bacon", *Revue des Questions Historiques*, L, 119-142 (1891), shows how through the nineteenth century the legend of Bacon's persecution kept receiving additions at the hands of imaginative writers. Abbé Feret wrote in 1891; the fragment discovered in 1897 by Gasquet renders the legend even more untenable.

In 1272 in the *Compendium Philosophiae* Bacon lays bare the failings of "the two orders" as if he belonged to neither, but he then proceeds to refute indignantly those masters at Paris who have tried to argue that the state of the higher secular clergy, such as bishops, is more perfect than that of the religious.³⁷

In 1277 however we learn "solely on the very contestable authority of the Chronicle of the XXIV Generals"³⁸ that at the suggestion of many friars the teaching of "Friar Roger Bacon of England, master of sacred theology", was condemned as containing "some suspected novelties", that Roger was sentenced to prison, and that the pope was asked to help to suppress the dangerous doctrines in question. It has been a favorite conjecture of students of Bacon that he incurred this condemnation by his leanings toward astrology and magic; when I come to discuss his opinions on those points, I shall show how unfounded is this supposition. Suffice it here to note that the wording of the chronicle suggests nothing of the sort, but rather some details of doctrine, whereas had Bacon been charged with magic, we may be pretty sure that so sensational a feature would not have passed unmentioned.

This is about all that we know of Bacon's life except the dates of one or two more of his works. Mr. Little regards it as "certain that Roger's last dated work was written in 1292",³⁹ but the evidence for this is a single passage in one manuscript; other statements in the work in question sound as if penned earlier.

We turn from Bacon's life to his writings, and shall centre our attention upon his three works to the pope. In them he had his greatest opportunity and did his best work both in style and substance. They embody most of his ideas and knowledge. Two of them are merely supplementary to the *Opus Maius* and are parallel to it in aims, plan, and contents. Its two chief aims were to demonstrate the practical utility of "philosophy", especially to the Church, and secondly, to reform the present state of learning according to Bacon's idea of the relative importance of the sciences. Having convinced himself that an exhaustive work on philosophy was not yet possible, Roger substituted this introductory treatise, outlining the paths along which future study and investigation should go. Of the thirty divisions of philosophy he considers only the five which he deems the most important and essential, namely,

³⁷ *Compendium Philosophiae*, Brewer, pp. 399, 425, 431.

³⁸ G. Delorme, "Roger Bacon", in Vacant and Mangenot, *Dictionnaire de Théologie Catholique*, II. (1910); "Ce fait, basé uniquement sur l'autorité fort contestable de la chronique des xxiv généraux", *Analecta Franciscana* (Quaracchi, 1897), III. 460.

³⁹ *Essays*, p. 27; Mandonnet, *Siger de Brabant* (second ed.), I. 248, questions this date.

the languages, "mathematics", perspective or optic, "experimental science" (including alchemy), and moral philosophy, which last he regards as "the noblest" and "the mistress of them all".⁴⁰ Treated in this order, these "sciences" form the themes of the last five of the seven sections of the *Opus Maius*. Inasmuch as Roger regarded himself as a reformer of the state of learning, he prefixed a first part on the causes of human error to justify his divergence from the views of the multitude. His second section develops his ideas as to the relations of "philosophy" and theology.

The mere plan of the *Opus Maius* thus indicates that it is not exclusively devoted to natural science. "Divine wisdom", or theology, is the end that all human thought should serve, and morality is the supreme science. Children should receive more education in the Bible and the fundamentals of Christianity, and spend less time upon "the fables and insanities" of Ovid and other poets who are full of errors in faith and morals.⁴¹ In discussing other sciences Bacon's eye is ever fixed upon their utility "to the Church of God, to the republic of the faithful, toward the conversion of infidels and the conquest of such as cannot be converted".⁴² This service is to be rendered not merely by practical inventions or calendar reform or revision of the Vulgate, but by aiding in most elaborate and far-fetched allegorical interpretation of the Bible. To give a very simple example of this, it is not enough for the interpreter of Scripture to know that the lion is the king of beasts; he must be so thoroughly acquainted with all the lion's natural properties that he can tell whether in any particular passage it is meant to typify Christ or the devil.⁴³ Also the marvels of human science strengthen our faith in divine miracles.⁴⁴ Bacon speaks of philosophy as the handmaid of "sacred wisdom";⁴⁵ he asserts that all truth is contained in Scripture, though philosophy and canon law are required for its comprehension and exposition, and that anything alien therefrom is utterly erroneous.⁴⁶ Nay more, the Bible is surer ground than philosophy even in the latter's own field of the natures and properties of things.⁴⁷ Furthermore, "philosophy considered by itself is of no utility".⁴⁸ Bacon believed not only that the active intellect (*intellectus agens*) by which

⁴⁰ Gasquet, p. 509.

⁴¹ *Opus Tertium*, Brewer, pp. 54-55.

⁴² This was a favorite formula with Bacon; see *Opus Tertium*, Brewer, pp. 3-4, 20; Gasquet, pp. 502, 509.

⁴³ *Opus Minus*, Brewer, p. 388.

⁴⁴ *Opus Tertium*, Brewer, p. 52.

⁴⁵ Gasquet, p. 509.

⁴⁶ *Opus Tertium*, Brewer, p. 81.

⁴⁷ Bridges, I. 43.

⁴⁸ *Ibid.*, p. 56.

our minds are illuminated was from God and not an integral part of the human mind,⁴⁹ but that all philosophy had been revealed by God to the sainted patriarchs and again to Solomon,⁵⁰ and that it was impossible for man by his own efforts to attain to "the great truths of the arts and sciences".⁵¹ Bacon alludes several times to sin as an obstacle to the acquisition of science,⁵² on the other hand, he observes that contemporary Christians are inferior morally to the pagan philosophers, from whose books they might well take a leaf.⁵³ All this gives little evidence of an independent scientific spirit, or of appreciation of experimental method as the one sure foundation of scientific knowledge. We see how much of a medieval friar and theologian and how little of a modern scientist Roger could be. It must, of course, be remembered that he is trying to persuade the Church to support scientific research; still, there seems to be no sufficient reason for doubting his sincerity in the above statements, though we must discount here as elsewhere his tendency to make emphatic and sweeping assertions.

Writers as far back as Cousin⁵⁴ and Charles⁵⁵ have recognized that Bacon was interested in the scholasticism of his time as well as in natural science. His separate works on the *Metaphysics* and *Physics* of Aristotle are pretty much the usual sort of medieval commentary;⁵⁶ the tiresome dialectic of the "Questions on Aristotle's *Physics*" is well brought out in Duhem's essay, "Roger Bacon et l'Horreur du Vide".⁵⁷ Bacon's works dedicated to the pope, on the contrary, are written to a considerable extent in a clear, direct, outspoken style; and the subjects of linguistics, mathematics, and experimental science seem at first glance to offer little opportunity for metaphysical disquisitions or scholastic method. Yet, here too, much space is devoted to intellectual battledore and shuttlecock with such concepts as matter and form, moved and mover, agent and patient, element and compound.⁵⁸ Such current

⁴⁹ *Ibid.*, p. 41. Bacon is believed to have rather misrepresented the position of William of Auvergne on this point, when he says that William twice reproved at Paris those who held the active intellect to be part of the soul. N. Valois, *Guillaume d'Auvergne* (Paris, 1880), pp. 289-290; É. Charles, *Roger Bacon: sa Vie, ses Ouvrages, ses Doctrines* (Bordeaux, 1861), p. 327.

⁵⁰ *Ibid.*, p. 45; Gasquet, p. 508; *Opus Tertium*, Brewer, p. 24.

⁵¹ Bridges, I. 45.

⁵² *Ibid.*, II. 170; *Compendium Philosophiae*, Brewer, pp. 405, 408.

⁵³ *Opus Tertium*, Brewer, p. 50: "Mirum enim est de nobis Christianis, qui sine comparatione sumus imperfectiores in moribus quam philosophi infideles. Legantur decem libri Ethicorum Aristotelis et innumerabiles Senecae, et Tullii, et aliorum, et inveniemus quod sumus in abysso vitiorum."

⁵⁴ V. Cousin, *Journal des Savants*, 1848, p. 467.

⁵⁵ Charles, *Roger Bacon*. This work will hereafter be cited as Charles.

⁵⁶ Little, *Essays*, p. 4: "They are in the prevalent dialectic style, and perhaps might be put into the class of works which Bacon afterwards ridiculed as 'horse-loads'."

⁵⁷ *Ibid.*, pp. 241-284.

⁵⁸ *Opus Minus*, Brewer, pp. 360-367.

problems as the unity of the intellect, the source of the *intellectus agens*, and the unity or infinity of matter are introduced for discussion,⁵⁹ although the question of universals is briefly dismissed.⁶⁰

Two other characteristic traits of scholasticism are found in the *Opus Maius*, namely, continual use of authorities and the highest regard for Aristotle, "summus philosophorum",⁶¹ as Bacon calls him. Because in one passage in his *Compendium Philosophiae* Bacon says in his exaggerated way that he would burn all the Latin translations of Aristotle if he could,⁶² it has sometimes been assumed that he was opposed to the medieval study of Aristotle. Yet in the very next sentence he declares that "Aristotle's labors are the foundations of all wisdom". What he wanted was more, not less Aristotle. He believed that Aristotle had written a thousand works.⁶³ He complains quite as much that certain works of Aristotle have not yet been translated into Latin as he does that others have been translated incorrectly. As a matter of fact, he himself seems to have made about as many mistakes in connection with the study of Aristotle as did anyone else. He thought many apocryphal writings genuine, such as the *Secret of Secrets*,⁶⁴ an astrological treatise entitled *De Impressionibus Coelestibus*,⁶⁵ and other writings concerning "the arcana of science" and "marvels of nature".⁶⁶ He overestimated Aristotle and blamed the translators for obscurities and difficulties which abound in the Greek text itself. He declares that a few chapters of Aristotle's *Laws* are superior to the entire corpus of Roman law.⁶⁷ His assertion that Robert Grosseteste paid no attention to translations of Aristotle is regarded as misleading by Baur.⁶⁸ He nowhere gives credit to Albertus Magnus and Thomas Aquinas for their great commentaries on Aristotle,⁶⁹ which are superior to any that he wrote. He bases some of his own views upon mistranslations of Aristotle, substituting, for instance, "matter" for "substance"—a mistranslation avoided by Albert and Thomas.⁷⁰

⁵⁹ Bridges, I, 38, 143; *Opus Tertium*, Brewer, p. 120.

⁶⁰ Bridges, I, 42.

⁶¹ *Opus Tertium*, Brewer, p. 6.

⁶² *Compendium Philosophiae*, Brewer, p. 469.

⁶³ *Ibid.*, p. 473. *Compendium Studii Theologie* (ed. H. Rashdall) in vol. III. of *British Society of Franciscan Studies* (Aberdeen, 1911), p. 34.

⁶⁴ He wrote a commentary on it; see Tanner MSS., 116, Bodleian Library.

⁶⁵ Bridges, I, 389.

⁶⁶ *Compendium Philosophiae*, Brewer, p. 473.

⁶⁷ *Opus Tertium*, Brewer, p. 50; *Compendium Philosophiae*, Brewer, p. 422.

⁶⁸ Ludwig Baur, *Die Philosophischen Werke des Robert Grosseteste* (Münster, 1912; Bd. IX. in Baeumker's *Beiträge z. Gesch. d. Philos. d. Mittelalters*), p. 15.

⁶⁹ Cousin, *Journal des Savants*, 1848, p. 300, concludes that because Bacon asserts that the *Politics* of Aristotle is not yet in use among the Latins, Albertus and Aquinas did not write their commentaries on this work until after 1266.

⁷⁰ K. Werner, "Die Kosmologie und Allgemeine Naturlehre des Roger

Despite its theological and scholastic proclivities Bacon's mind had a decidedly critical bent. He was, like Petrarch, profoundly pessimistic as to his own times. Church music, present-day sermons, the immorality of monks and theologians, the misconduct of students at Oxford and Paris, the wars and exactions of kings and feudal lords, the prevalence of Roman Law—these are some of the faults he has to find with his age.⁷¹ The *Opus Maius* is largely devoted, not to objective presentation of facts and discussion of theories, but to subjective criticism of the state of learning and even of individual contemporary scholars. This last is so unusual that Bacon excuses himself for it to the pope in both the supplementary treatises.⁷² Several other works of Bacon display the same critical tendency. The *Compendium Philosophiae* enlarges upon the complaints and criticisms of the three works. In the *Tractatus de Erroribus Medicorum* he detected in contemporary medicine "thirty-six great and radical defects with infinite ramifications".⁷³ But in medicine, too, his own contributions are of little account. In the *Compendium Studii Theologiae*, after contemptuous allusion to the huge *Summae* of the past fifty years, he opens with an examination of the problems of speculative philosophy which underlie the questions discussed by contemporary theologians. As far as we know that is as far as he got. And in the five neglected sciences to which his *Opus Maius* was a mere introduction he seems to have made little further progress than is there recorded; it has yet to be proved that he made any definite original contribution to any particular science or branch of learning.

After all, we must keep in mind the fact that in ancient and medieval times hostile criticism was more likely to hit the mark than were attempts at constructive thought and collection of scientific details. There were plenty of wrong ideas to knock down; it was not easy to find a rock foundation to build upon, or materials without some hidden flaw. The church fathers made many telling shots in their bombardment of pagan thought; their own interpretation of nature and life less commands our admiration. So Roger Bacon, by devoting much of his space to criticism of the mistakes of others and writing "preambles" to science and theology, avoided treacherous detail—a wise caution for his times. Thus he constructed a sort of intellectual portico more pretentious than he

Bacon", in *Sitzungsberichte* of the Vienna Academy, ph.-hist. Cl. (Vienna, 1879), XCIV. 495. For further errors by Bacon concerning the text of Aristotle see Duhem, "Roger Bacon et l'Horreur du Vide", in Little, *Essays*, pp. 254 and 259.

⁷¹ *Opus Tertium*, Brewer, pp. 302, 304; *Compendium Philosophiae*, Brewer, pp. 412, 429, 399, 418 ff.; and *Opus Tertium*, pp. 84 ff.

⁷² Gasquet, p. 503; Brewer, pp. 29–30.

⁷³ Little, *Essays*, p. 347; E. Withington, "Roger Bacon and Medicine".

could have justified by his main building. To a superficial observer this portico may seem a fitting entrance to the temple of modern science, but a closer examination discovers that it is built of the same faulty materials as the neglected ruins of his contemporaries' science.

Merely to have assumed a critical point of view in the Middle Ages may seem a distinction; but Abelard, Adelard of Bath, William of Conches, and Daniel Morlay were all critical, back in the twelfth century. Moreover, our estimate of any critic must take into account how valid, how accurate, how original, and how consistent his criticisms were and from what motives they proceeded. Some of Bacon's complaints the reader of medieval literature has often listened to before. What student of philosophy in the twelfth and thirteenth centuries had not sighed at the invasion of the Roman Law into school and Church and State? What devotee of astronomy had failed to contrast its human interest and divine relationships with the dry drubbing of the jurists? What learned man had not expressed his preference for the wise and the experts (*sapientes*) over the *vulgaris* or common herd? The great secrets of learning and the danger of casting pearls before swine were also quite familiar concepts. If Bacon goes a step farther and speaks of a *vulgaris studentium* and even of a *vulgaris medicorum*, he is only refining a medieval commonplace.

In Bacon's discussion of the four causes of human error his attack upon undue reliance on authority has often seemed to modern readers most unusual for his age. But all his arguments against authority are drawn from authorities;⁷⁴ and while he seems to have got a whiff of the spirit of rationalism from such classical writers as Seneca and Cicero, he also quotes the *Natural Questions* of his fellow-countryman, Adelard of Bath, who in the early twelfth century had found the doctrine of the schools of Gaul as little to his liking as was that of Paris to Roger's taste, and who had gone to Spain and the Saracens for new ideas, and of whose originality and scientific standpoint I have treated elsewhere.⁷⁵ Bacon does

⁷⁴ Rashdall says in the introduction to his edition of Bacon's *Compendium Studiorum Theologiae* (Aberdeen, 1911), p. 3: "There is a certain irony in the fact that the writer's argument in favor of independent thinking as against authority consists chiefly of a series of citations."

⁷⁵ Bridges, I. 5-6, and also p. 7, where Bacon quotes another sentence from Adelard without naming him, "Et ideo multi . . . cur a tergo non scribitis." Adelardus Bathoniensis, *Questiones Naturales* (Louvain, 1480). Also at Eton College, MS. 161, of the twelfth century. I have discussed Adelard somewhat in a lecture on "Natural Science in the Middle Ages", *Popular Science Monthly*, September, 1915, pp. 271-291; and in *Nature*, February 4, 1915, pp. 616-617, "Adelard of Bath and the Continuity of Universal Nature", where I show that a theory in physics whose origin Professor Duhem attributes to Bacon is found earlier in Adelard.

not cite another twelfth-century Englishman, Daniel Morlay; but his fourth cause of human error, the concealment of ignorance by a false show of learning, might well have been suggested by passages in Daniel's preface to the Bishop of Norwich. There Daniel satirizes the *bestiales* who occupied chairs in the schools of Paris "with grave authority", and reverently marked their Ulpian with daggers and asterisks, and seemed wise as long as they concealed their ignorance by a statuesque silence, but whom he found "most childish" when they tried to say anything. He also warns his readers not to spurn Arabic clarity for Latin obscurity; it is owing to their ignorance and inability to attain definite conclusions that Latin philosophers of his day spin so many elaborate figments and hide "uncertain error under the shadow of ambiguity".⁷⁶

Bacon's criticisms have usually been taken to apply to medieval learning as a whole, but a closer examination shows their application to be much more limited. In the first place, he is thinking only of the past "forty years" in making his complaints; in the good old days of Grosseteste, Adam Marsh, William Wolf, and William of Shyrwood things were different and scholarship flowed smoothly, if not copiously, in the channels marked out by the ancient sages;⁷⁷ nor does Bacon deny that there was a renaissance of natural science and an independent scientific spirit still farther back in the twelfth century.⁷⁸

⁷⁶ *Philosophia Magistri Danielis de Merlai ad Iohannem Norwicensem Episcopum*, Arundel MSS., 377 (British Museum), fols. 88–103, thirteenth century. A little of it has been printed by T. Wright, *Biogr. Brit. Lit.* (London, 1846), II. 227–230; and by V. Rose in *Hermes*, VIII. (1874). Rose's list of the authorities cited by Daniel is woefully incomplete. Daniel seems to have lived in the late twelfth century and to have been a pupil of Gerard of Cremona.

⁷⁷ Bridges, I. 17; *Opus Tertium*, Brewer, pp. 70, 91, 187.

⁷⁸ See the excellent but little known treatise of Charles Jourdain, *Dissertation sur l'État de la Philosophie Naturelle en Occident et principalement en France pendant la Première Moitié du XIIe Siècle* (Paris, 1838). For a brief general survey of natural science in the twelfth and thirteenth centuries, see my lecture referred to in note 75.

It is still difficult even for the reader of French and German to find out much about medieval natural science or medicine or pharmacy. One must, then, go back to the original Latin sources, if not to the Arabic and other languages, and these sources are not easy to get at, existing in many cases only in rare old editions or in manuscript. Histories both of science in general and of the individual sciences are usually compiled chiefly from old and dubious secondary sources; devote little space to the Middle Ages; and too often give little more than biographical and bibliographical detail, which is often wrong, rather than estimate the authors' subject-matter. In such works, too, occult science and magic, which played so large and important a part, are generally neglected or misinterpreted.

Such works, however, as the following are of considerable service: F. Danemann, *Die Naturwissenschaften in ihrer Entwicklung und in ihrem Zusammenhange*; E. Meyer, *Geschichte der Botanik* (Königsberg, 1855); M. Cantor, *Vorlesungen über Geschichte der Mathematik* (Leipzig, 1913, latest ed.); E. Gerland, *Geschichte der Physik* (Munich, 1913); E. Gerland and F. Traumüller, *Geschichte der Physikalischen Experimentierkunst* (Leipzig, 1899); F. Picavet, *Esquisse d'une Histoire Comparée des Philosophies Médiévales* (Paris, 1905); and the writings of Daremberg on the history of medicine and of Delambre on that of

Secondly, except for his tirades against the Italians and their civil law, Bacon's criticisms apply to but two countries, France and England, and two universities, Oxford and Paris. Also those few contemporaries whom he praises are either his old Oxford friends or scattered individuals in France. Of the state of learning in Italy, Spain, and Germany he says little and apparently knew little. Amid his sighing for some prince or prelate to play the patron to science, he never mentions Alfonso X. of Castile, who was so interested in the "mathematics" and occult science which were so dear to Bacon's heart;⁷⁹ Roger even still employs the old Toletan astronomical tables of Arzachel instead of the Alfonsine tables issued in 1252, the first year of that monarch's reign.⁸⁰ While complaining of the ignorance of the natures and properties of animals, plants, and minerals which is shown by contemporary theologians in their explanation of Scriptural passages, Bacon not only slighted the encyclopedias which several clergymen like Alexander Neckam, Bartholomew of England, Thomas of Cantimpré, and Vin-
astronomy. In English there is an entertaining history of medicine with a good bibliography by E. Withington (London, 1894). In medicine and mathematics there are also periodicals dealing with the history of those fields such as *Janus* and *Bibliotheca Mathematica*. Dealing more specially with the Middle Ages are the following: Berthelot, *La Chimie au Moyen Age* (Paris, 1893), an admirable research bringing out many new points but after all based on the study of only a few of the numerous available manuscripts in medieval alchemy and chemistry; Millot-Carpentier, "La Médecine au XIII^e Siècle", in *Annales Internationales d'Histoire* (Congrès de Paris, 1900, 5^e section, *Histoire des Sciences*); R. von Toply, *Studien zur Geschichte der Anatomie im Mittelalter* (Leipzig, 1898); F. A. Pouchet, *Histoire des Sciences Naturelles au Moyen Age* (Paris, 1853), limited chiefly to an estimate of Albertus Magnus as a natural scientist; Strunz, *Geschichte der Naturwissenschaften im Mittelalter* (Stuttgart, 1910, 120 pp., no notes). On medieval lapidaries see L. Pannier, *Les Lapidaires Français du Moyen Age* (Paris, 1882), and the writings of F. de Mély. Several essays by Valentine Rose in such periodicals as *Hermes* and *Zeitschrift für Deutsches Alterthum* deal with matters of medieval science and superstition, and call attention to neglected manuscripts. The numerous publications of Moritz Steinschneider upon Hebrew and Arabian writings and the Latin translations thereof often touch on natural science, alchemy, and astrology, but chiefly from the bibliographical and biographical standpoint. Helpful in a similar way are "The Reception of Arabic Science in England", *English Historical Review*, January, 1915, and other recent articles by C. H. Haskins. Cousin and Hauréau in their well-known works, though interested primarily in scholasticism, occasionally touch on science in their researches into the manuscript sources. The *Histoire Littéraire de la France* sometimes describes the contents of medieval works of natural and occult science, as well as the biography and bibliography of their authors.

Of the medieval Latin texts some, like Bacon's *Opus Maius* and the complete works of Albertus Magnus, have received separate modern editions; others, if written by Englishmen or by ecclesiastics of the twelfth century, are sometimes found in the *Rolls Series* or Migne's *Patrologie Latine*; while many formerly little known works are now being published in the two series, *Abhandlungen zur Geschichte der Mathematischen Wissenschaften* (Teubner), and *Beiträge zur Geschichte der Philosophie des Mittelalters* (herausgegeben von C. Baeumker.) J. L. Pagel has edited some hitherto inaccessible works of medicine.

⁷⁹ Bacon's ignorance of Spanish would probably in any case have prevented him from securing Alfonso as a patron.

⁸⁰ Bridges, I. 192, 196, 271, 298, 299, note.

cent of Beauvais had compiled; he also says nothing of the school at Cologne of Albertus Magnus, whose reputation was already established by the middle of the century,⁸¹ who personally investigated many animals, especially those of the north, and often rectified the erroneous assertions of classical zoologists, whom the historian of botany has lauded,⁸² whose students too were curious to know not only the theoretical botany that passed under the name of Aristotle, but also the particular characteristics of plants, and who in his five books on minerals discusses the alchemy and indulges in the same occult science and astrology which Bacon deemed so important. Yet Albert was a noted theologian and biblical commentator as well as a student of nature. In his lamentation over the sad neglect of astrology among the "Latins"⁸³ Bacon ignores the voluminous Latin treatise on that art by his contemporary, Guido Bonati of the University of Bologna, though it shows wide reading in both classical and Arabian astrologers.⁸⁴ Bacon grieves at the neglect of the science of optic by his age, and says that it has not yet been lectured

⁸¹ Ptolemy of Lucca (Muratori, XI., col. 1150 ff.) says that Albert and his pupil Aquinas were flourishing in the time of Pope Alexander IV. (1253). After resigning the bishopric of Ratishon, Albert spent the last 18 years of his life (1262-1280) teaching at Cologne. Mandonnet, *Siger de Brabant* (second ed.), I. 36, places the beginning of the publication of Albert's great works in philosophy about 1245, though he puts his birth in 1206 instead of 1193, the traditional date. Albert seems to have spent only a few years of his life in France, perhaps about 1248 (*Hist. Litt. de la France*, XIX. 362-381).

In saying that Bacon does not mention Albert's work in natural science, I of course do not mean to imply that he never mentions Albert. He excuses his delay in answering the pope by declaring that the most noted Christian scholars, such as Brother Albert of the Order of Preachers and Master William of Shrywood, could not in ten years produce such a work as he transmits; and he incidentally observes that William is a far abler scholar than Albert (*Opus Tertium*, Brewer, p. 14). I am suspicious however of the integrity of the passage (*Compendium Philosophiae*, Brewer, p. 426) where Bacon sneers at the theological teaching of "the boys of the two Orders, such as Albert and Thomas and the others who enter the Orders when twenty years or under". It seems incongruous for Bacon to speak of his senior, Albert, as a boy. Other passages in Bacon's works which have been taken to apply to Albert, though he is not expressly named, seem to me not to apply to him at all closely; and if meant for him, they show that Bacon was an incompetent and unfair critic. Not only was Albert only for a short time in Paris; he does not seem to have been in sympathy with the conditions there which Bacon attacks. Nor can I see that Bacon is meant in the passage at the close of Albert's *Politics* (*Opera*, ed. Borgnet, VIII. 803-804, and Mandonnet, *Siger de Brabant*, p. 332), where he declares that its doctrines, as in his books on physics, are not his own theories but a faithful reflection of peripatetic opinion; and that he makes this statement for the benefit of lazy persons who occupy their idle hours in searching writings for things to criticise; "Such men killed Socrates, drove Plato from Athens to the Academy, and, plotting even against Aristotle, forced him into exile." Such a passage seems a commonplace one. Both Adelard of Bath and William of Conches express the same fear of setting forth new ideas of their own, and medieval writers not infrequently in their prefaces apprehend with shrinking "the bite of envy" which both their Horace and personal experience had taught would follow fast on publication.

⁸² E. Meyer, *Gesch. d. Botanik*, IV. 39-40.

⁸³ Bridges, I. 389.

⁸⁴ Guido Bonati, *Liber Astronomicus* (Augsburg, 1491), 422 fols.

on at Paris nor among the Latins except twice at Oxford;⁸⁵ he does not mention the important work of Witelo, a Pole who travelled in Italy.⁸⁶ Perhaps the books of Witelo and Bonati were not yet published when Bacon wrote in 1266 and 1272, but they were probably well under way and their production can scarcely be attributed to his influence.

Thirdly, while Bacon occasionally makes bitter remarks about the present state of learning in general, it is the teaching of theology at Paris and by the friars that he has most in mind and that he especially desires to reform. Though himself a friar and master of theology, he had been trained and had then himself specialized in the three learned languages, Hebrew, Greek, and Arabic, in optic and geometry, in astronomy and astrology, in alchemy and "experimental science", and in the writings of the classical moralists. Consequently he thought that no one could be a thorough theologian who did not go through the same course of training; nay, it was enough to ruin the reputation of any supposed scholar in Bacon's sight, if he were unacquainted with these indispensable subjects. Bacon held that it was not sufficient preparation for theology merely to study "the common sciences, such as Latin grammar, logic, and a part of natural philosophy, and a little metaphysics".⁸⁷ However, it was not that he objected to these studies in themselves, nor to the ordinary university instruction in the arts course; in fact, he complains that many young friars start in to study theology at once and "presume to investigate philosophy by themselves without a teacher".⁸⁸ Bacon has a low opinion of the scholarship of Alexander of Hales because his university education had been completed before the chief authorities and commentaries in natural philosophy and metaphysics had been translated. Against another friar generally regarded by the academic world as its greatest living authority Bacon brings the charge that "he never heard philosophy in the schools", and "was not instructed nor trained in listening, reading, and disputing, so that he must be ignorant of the common sciences".⁸⁹ Such passages show that to represent Bacon's writings as full of "sweeping attacks" upon the "metaphysical subtleties and verbal strifes" of his age is to exaggerate his position.⁹⁰ There are not many direct attacks upon scholastic method in his works.

⁸⁵ *Opus Tertium*, Brewer, p. 37.

⁸⁶ Baeumker, *Witelo, ein Philosoph und Naturforscher des XIII. Jahrhunderts* (Münster, 1906).

⁸⁷ *Opus Minus*, Brewer, p. 324.

⁸⁸ *Compendium Philosophiae*, Brewer, p. 426.

⁸⁹ *Opus Minus*, Brewer, pp. 326-327.

⁹⁰ Bridges, I. xxx.

It is true that Bacon complains of the lack of good teachers in his day, saying in the *Opus Minus* that he could impart to an apt pupil in four years all the knowledge that it had taken himself forty years to acquire,⁹¹ and in the *Opus Tertium* that he could do it in a half or a quarter of a year, and that he could teach a good student all the Greek and Hebrew he need know in three days for each subject.⁹² But aside from the young friars who presume to teach theology, the teachers against whom he rails most are those in his favorite subject of "mathematics". Bacon could teach more useful geometry in a fortnight than they do in ten or twenty years⁹³ —a hint that much time was given in those days to the study of mathematics. These boasts are not, however, as wild as they may at first seem; after all Roger did not know a vast amount of geometry and Greek and Hebrew, and he had no intention of teaching any more of mathematics and the languages than would be of service in his other sciences, in theology, and in practical life.

It is easy to discern the personal motives which actuated Bacon in his criticism. He grieved to see the neglect by his fellow theologians of the subjects in which he was particularly interested, and to see himself second in reputation, influence, and advancement to the "boy theologians". It angered him that these same narrowly educated and narrow-minded men should "always teach against these sciences in their lectures, sermons, and conferences".⁹⁴ And after all, as he tells the pope, he does not wish to revolutionize the curriculum nor overthrow the existing educational system, "but that from the table of the Lord, heaped with wisdom's spoils, I, poor fellow, may gather the falling crumbs I need". Comment would only weaken the force of this confession.

Bacon's allusions to and dates for events in the history of medieval learning are sometimes hard to fit in with what we learn from other sources, and he has been detected in misstatements of the doctrines of other scholars.⁹⁵ His personal diatribes against the Latin translators of Greek and Arabian science seem overdrawn and unfair, especially when he condemns the first translators for not knowing the sciences in question before they ventured to translate, whereas it is plain that the sciences could not be known to the Latin world until the translations had been made. Indeed, it may be doubted if Roger himself knew Arabic well enough to read

⁹¹ Gasquet, p. 507.

⁹² *Opus Tertium*, Brewer, p. 65.

⁹³ Gasquet, p. 507.

⁹⁴ *Ibid.*, pp. 504-505; and Bridges, I. 31; see also *Opus Tertium*, Brewer, p. 59.

⁹⁵ See notes 49 and 68.

scientific works therein without a translation or interpreter. Especially unjustifiable and ill advised seems his savage onslaught upon William of Meerbeke,⁹⁶ whom Aquinas induced to translate Aristotle from the Greek, who was like Bacon interested in occult science, and to whom Witelo dedicated his treatise on optic. As William held the confidential post of papal chaplain and penitentiary under Clement IV., and as he became archbishop of Corinth about the time that Roger was condemned to prison, there may have been some personal rivalry and bitterness between them.

It should be said to Bacon's credit that his own statements do not support the inference which others have drawn from them, that he was alone in the advocacy or pursuit of the studies dear to him. In the *Opus Minus* he says to the pope, with rather unusual modesty it must be admitted, "I confess that there are several men who can present to Your Wisdom in a better way than I can these very subjects of which I treat".⁹⁷ And though the secrets of the arts and sciences are neglected by the crowd of students and their masters, "God always has reserved some sages who know all the necessary elements of wisdom. Not that anyone of them knows every detail, however, nor the majority of them; but one knows one subject, another another, so that the knowledge of such sages ought to be combined".⁹⁸ Combine it Bacon does for the pope's perusal, and he is not ashamed to speak on its behalf, for though there are fewer Latins conversant with it than there should be, there are many who would gladly receive it, if they were taught.⁹⁹ Thus he speaks not merely as an exponent of his own ideas, but as the representative of a movement with a considerable following at least outside of strictly theological circles.

Bacon has been given great credit for pointing out the need of calendar revision three centuries before the papacy achieved it; but he says himself that not only wise astronomers but even ordinary *computistae* were already aware of the crying need for reform,¹⁰⁰ and his discussion of the calendar often coincides verbally with Grosseteste's *Computus*.¹⁰¹ When Cardinal Pierre d'Ailly over a century later again urged the need of reform upon Pope John

⁹⁶ In the *Compendium Philosophiae*, written about 1272 (Brewer, p. 472). Mandonnet, *Siger de Brabant*, p. 40, rejects Bacon's aspersions upon William's translations. On William's career and writings see *Hist. Litt. de la France*, XXI. 146.

⁹⁷ Gasquet, p. 505: "Quamvis autem fatear quod plures sunt qui hec eadem que tracto possunt meliori modo quam ego vestre sapientie referre."

⁹⁸ *Ibid.*, p. 502.

⁹⁹ *Ibid.*, p. 504.

¹⁰⁰ *Ibid.*, p. 515; *Opus Tertium*, Brewer, pp. 274, 275, 295.

¹⁰¹ L. Baur, "Der Einfluss des Robert Grosseteste auf die Wissenschaftliche Richtung des Roger Bacon", in Little, *Essays*, p. 45.

XXIII., he cited Grosseteste often, but Bacon seldom or never.¹⁰² The treatment of geography in the *Opus Maius* is simply an intelligent compilation of well-known past writers, including the wretched work of Ethicus, supplemented from writings of the friars who had recently visited the Tatars. The Parisian version of the Bible, against which Bacon inveighs as a corruption of the Vulgate, was in the first instance the work of a conscientious Hebrew scholar,¹⁰³ and the numerous corrections and changes made in it since, though deplored by Bacon, show the prevalent interest in such matters. While Bacon holds that there are very few men who understand the theory of Greek, Hebrew, and Arabic grammar, or the technique of the sciences which have to be studied from those languages, he admits that many men are found among the "Latins" who can speak those tongues, and that there are even plenty of teachers of Greek and Hebrew at Paris and elsewhere in France and England.¹⁰⁴

LYNN THORNDIKE.

(*To be continued.*)

¹⁰² Petrus de Alliaco, *De Correctione Kalendarii*, in an edition of the works of d'Ailly and Gerson printed about 1480.

¹⁰³ S. A. Hirsch, "Roger Bacon and Philology", in Little, *Essays*, p. 145.

¹⁰⁴ *Opus Tertium*, Brewer, pp. 34, and *Compendium Philosophiae*, Brewer, p. 434.